UM1678
User manual

Evaluation kit for RX95HF NFC transceiver

Introduction

The EVAL-RX95HF is an evaluation kit for RX95HF NFC transceiver. This component is a 13.56 MHz near field communication transceiver for NFC tag emulation. It can be used with any NFC reader/writer (NFC smartphone, DEMO-CR95HF-A board) to exchange NDEF messages (URI, VCARD, URL) or proprietary data. The firmware embeds two kinds of applications:

- NFC Type 4 tag emulation
- IAP (In Application Programming) through the RF Field

The communication protocol is based on the NFC Forum digital protocol (part A) and Type 4.

The EVAL-RX95HF is powered through the USB bus. It includes an RX95HF transceiver for tag emulation, a 47 x 34 mm 13.56 MHz inductive etched antenna and its associated tuning components. The RX95HF communicates with the STM32F103RF 32-bit MCU via the SPI bus.

- Ready-to-use printed circuit board
  - RX95HF-VMD5 13.56 MHz NFC transceiver for tag emulation (VFQFPN32 5x5 package)
  - STM32F103RFT6 64LQFP 32-bit microcontroller, with 768 Kbytes of Flash memory
  - 47 x 34 mm 13.56 MHz inductive antenna etched on PCB and associated circuitry
  - USB miniB connector for board powering
  - LED indicating the presence of an RF field
  - Microcontroller reset button
  - Joystick for menu selection
  - JTAG connector for microcontroller firmware upgrade and debug
  - LCD screen (MB895 board)
- USB cable: Type A / mini B
- Associated firmware and Android application
  - On-board firmware for the NFC 14443A Tag emulator (NDEF, URL)
  - Android application for "RX95HF Upgrade Firmware" smartphone

Figure 1. EVAL-RX95HF RF transceiver board with LCD screen plugged

Contents

1 Quick start 4

2 Features 5

3 Hardware and layout description 6

3.1 EVAL-RX95HF board description 6

3.2 EVAL-RX95HF board powering and startup 7

3.3 Program/debug the RF transceiver demo board 7

4 Electrical schematic diagrams 8

5 Revision history 9

List of figures

Figure 1. EVAL-RX95HF RF transceiver board with LCD screen plugged 1
Figure 2. Functional block diagram 6
Figure 3. EVAL-RX95HF RF transceiver board with callouts. 6
Figure 4. Schematic diagram of the EVAL-RX95HF board 8

1 Quick start

The EVAL-RX95HF kit is a ready-to-use development kit used to evaluate some functions and performances of the RF transceiver RX95HF for NFC Tag emulation. The RF communication supports ISO/IEC 14443 Type A communication in NFC Tag Emulation mode.

The ST Android application "RX95HF Upgrade Firmware" shows a proprietary IAP application. The user can upload from the NFC reader (NFC Phone or RFID reader) the firmware of the STM32F103 of the EVAL-RX95HF board and boot on it.

For more information on the RX95HF evaluation kit and associated demonstration software, please visit *www.st.com/nfc-rfid*.

2 Features

- RX95HF, a 13.56-MHz multi-protocol contactless transceiver IC with SPI serial access communication
- 2-turn, 13.56-MHz etched loop antenna (47 mm x 34 mm) with associated tuning circuit
- STM32F103RFT6, a 32-bit microcontroller with 728 Kbytes of Flash memory and USB interface in a 64-pin LQFP package
- KF33BDT, a 3.3 V low dropout (LDO) voltage regulator
- USB mini B connector
- NX2016SA, a 27.12-MHz EXS00A-CS01188 crystal oscillator for RX95HF transceiver
- HC-49SD 8.000MHz 20pF/80ppm for STM32
- 20-pin JTAG connector for STM32 programming and debugging
- 1 push-button (Reset)
- 1 joystick (4 directions + select)

3 Hardware and layout description

3.1 EVAL-RX95HF board description

Figure 2. Functional block diagram

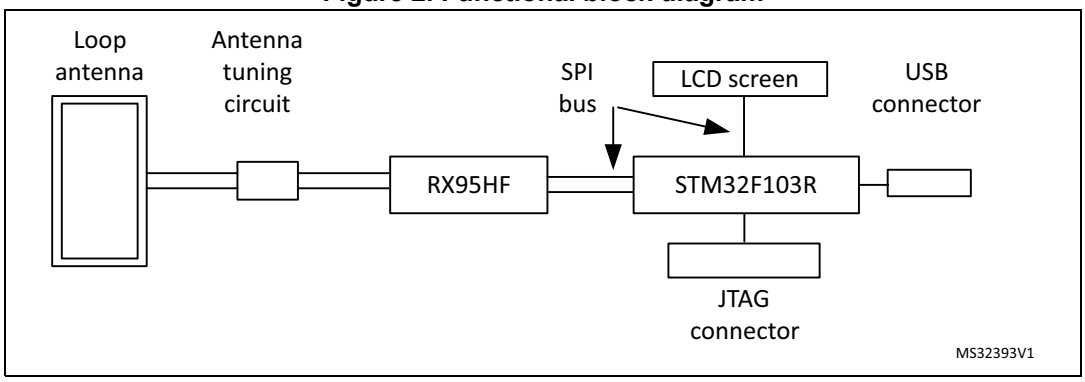
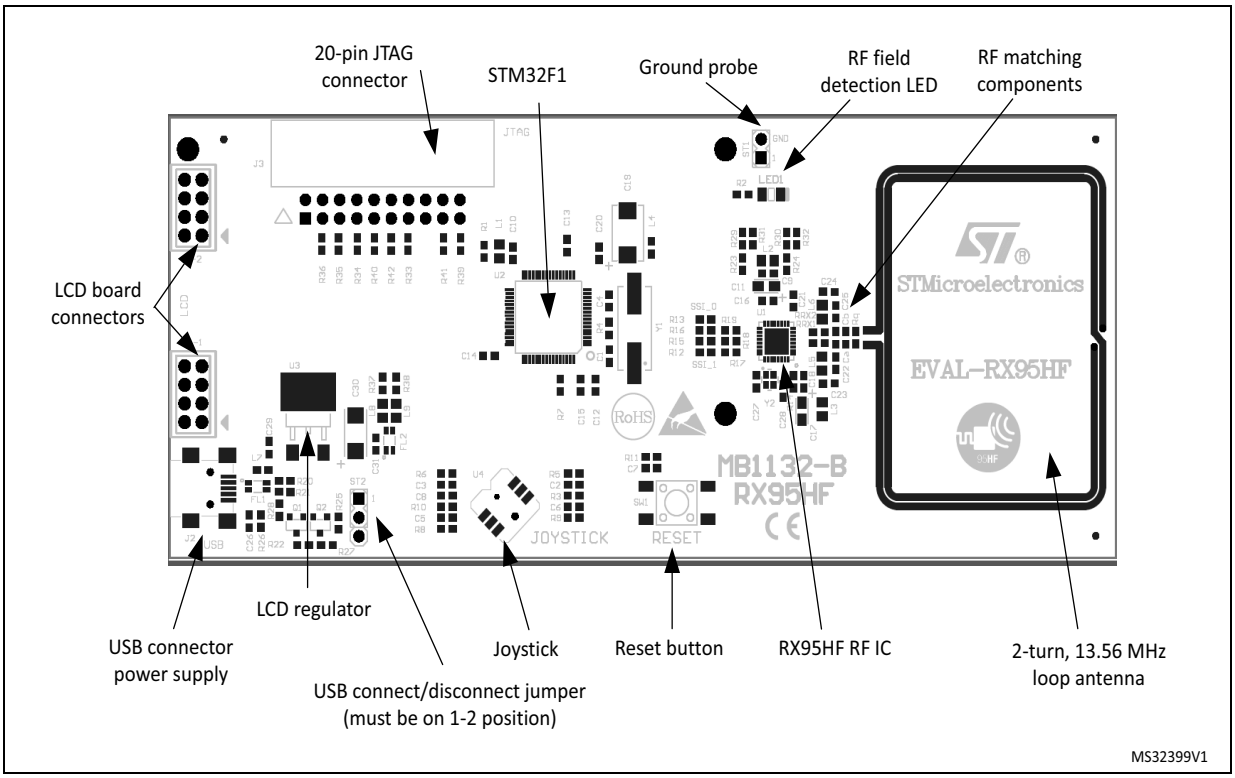


Figure 3. EVAL-RX95HF RF transceiver board with callouts



3.2 EVAL-RX95HF board powering and startup

The RF transceiver demonstration board is powered by the USB bus via a Type A / mini B USB cable connected to a PC.

When powered up, the RX95HF starts in an autonomous mode called "NFC tag emulation". When an NFC reader is present in front of the board antenna, the red LED1 lights up when an RF field is detected.

The NFC reader, in tag hunting mode (native application of Android phone), will get the ST web site URL: *www.st.com* from the RX95HF.

If "RX95HF Upgrade Firmware" Android application is installed on an NFC smartphone, an EVAL-RX95HF new firmware can be uploaded and the MCU reboots with this new firmware.

A complete description of the firmware and Android application can be found in application notes posted on ST web site.

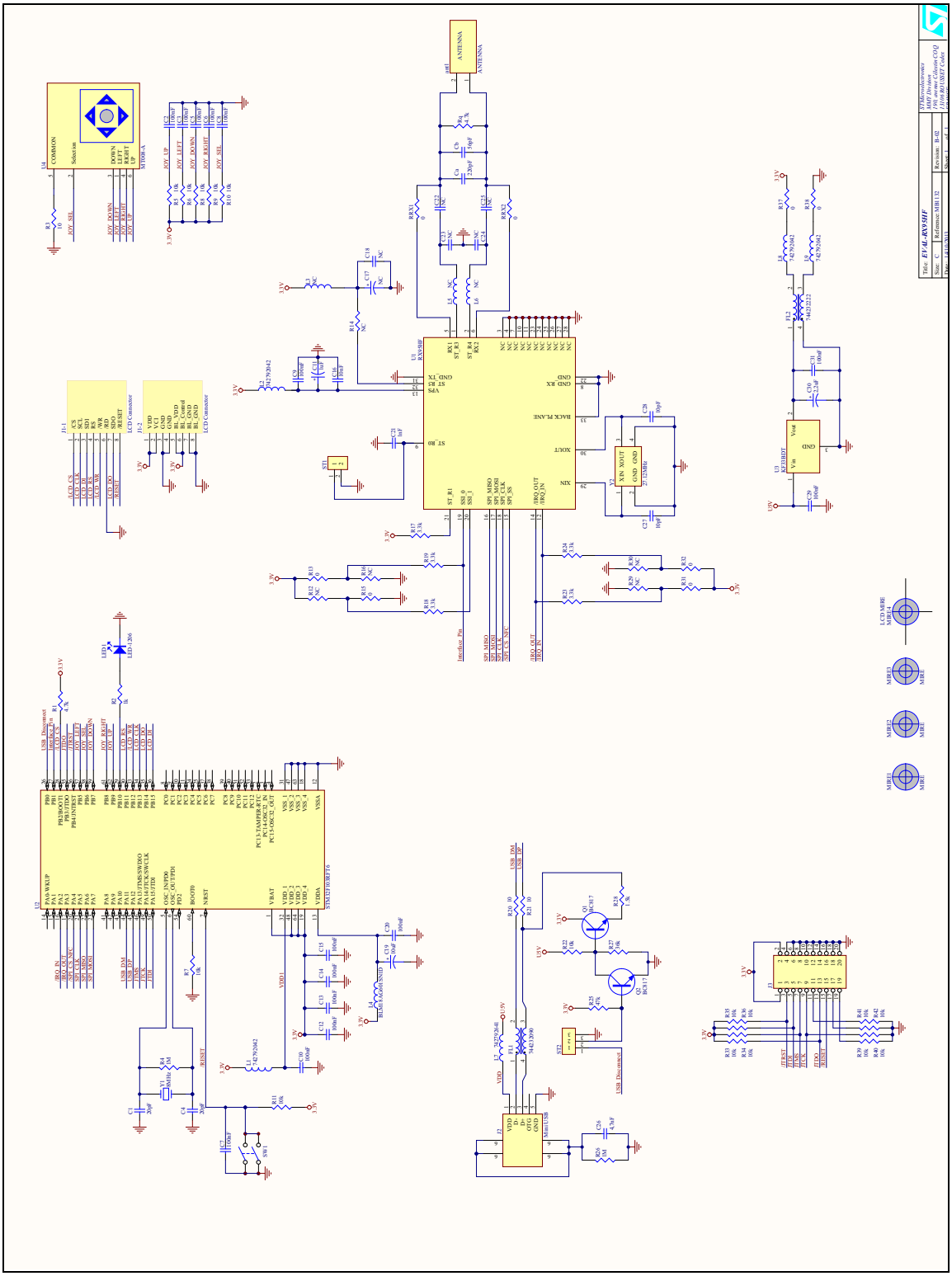
3.3 Program/debug the RF transceiver demo board

In order to flash or debug an STM32 microcontroller application on the EVAL-RX95HF board, simply connect the 20-pin JTAG/SWD flat ribbon of the STLINK/V2 in-circuit debugger and programmer to the RF transceiver demonstration board JTAG connector (J3). Launch STLink Utility PC software (can be downloaded from ST web site: http://www.st.com/web/en/catalog/tools/PF258168. STM32F103RFT6 is part of the STM32F10x XL-density family.

For more information or documentation on the STLINK/V2 in-circuit debugger and programmer, please visit *www.st.com*.

4 Electrical schematic diagrams

Figure 4. Schematic diagram of the EVAL-RX95HF board



5 Revision history

Table 1. Document revision history

Date	Revision	Changes
31-Oct-2013	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER’S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR “AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL” INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.
Information in this document supersedes and replaces all information previously supplied.
The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2013 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com